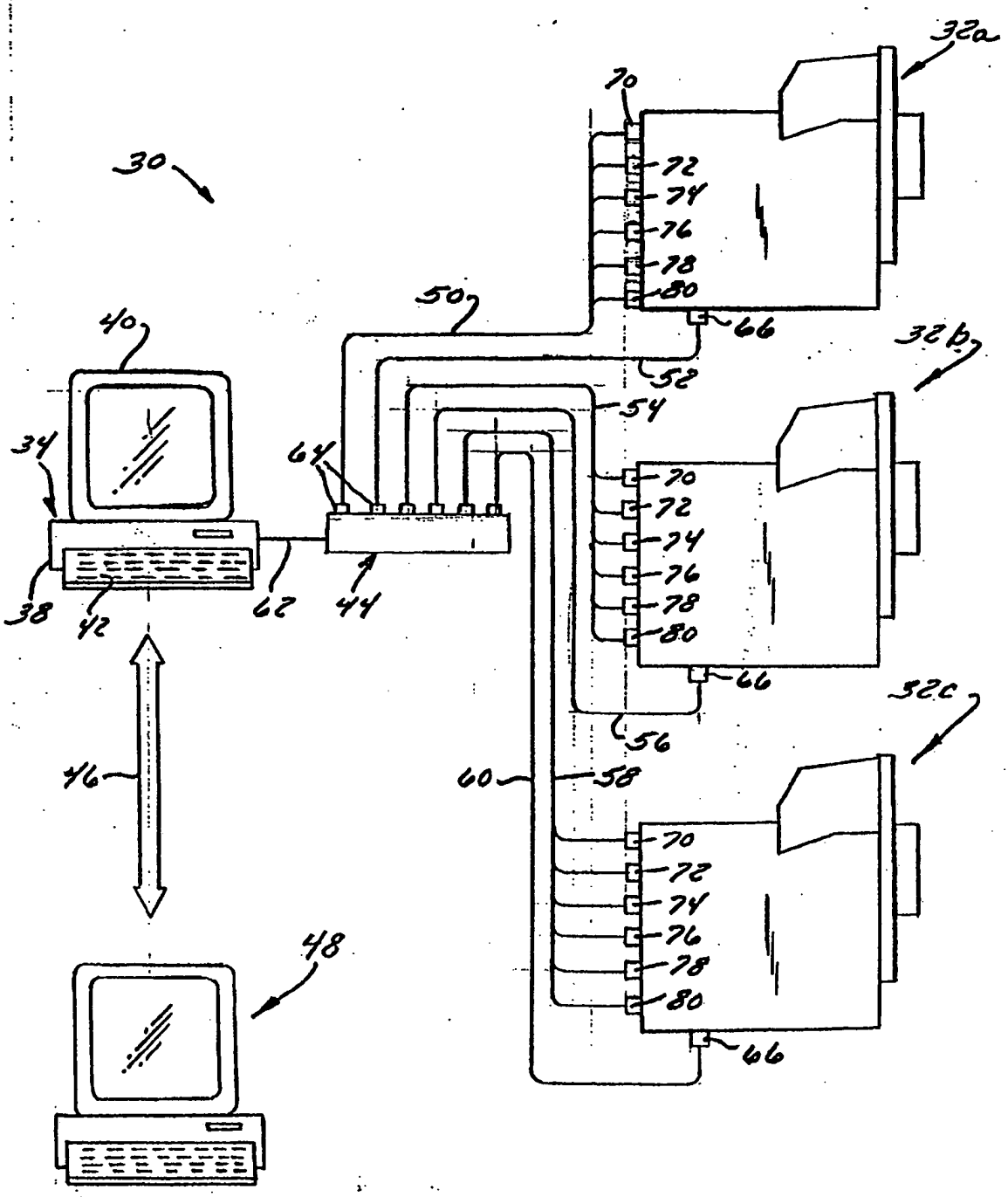
30
32a
32b
32c
40
34
38
42
62
44
64
50
52
54
56
58
60
46
48
66
70
72
74
76
78
80

FIG. 1

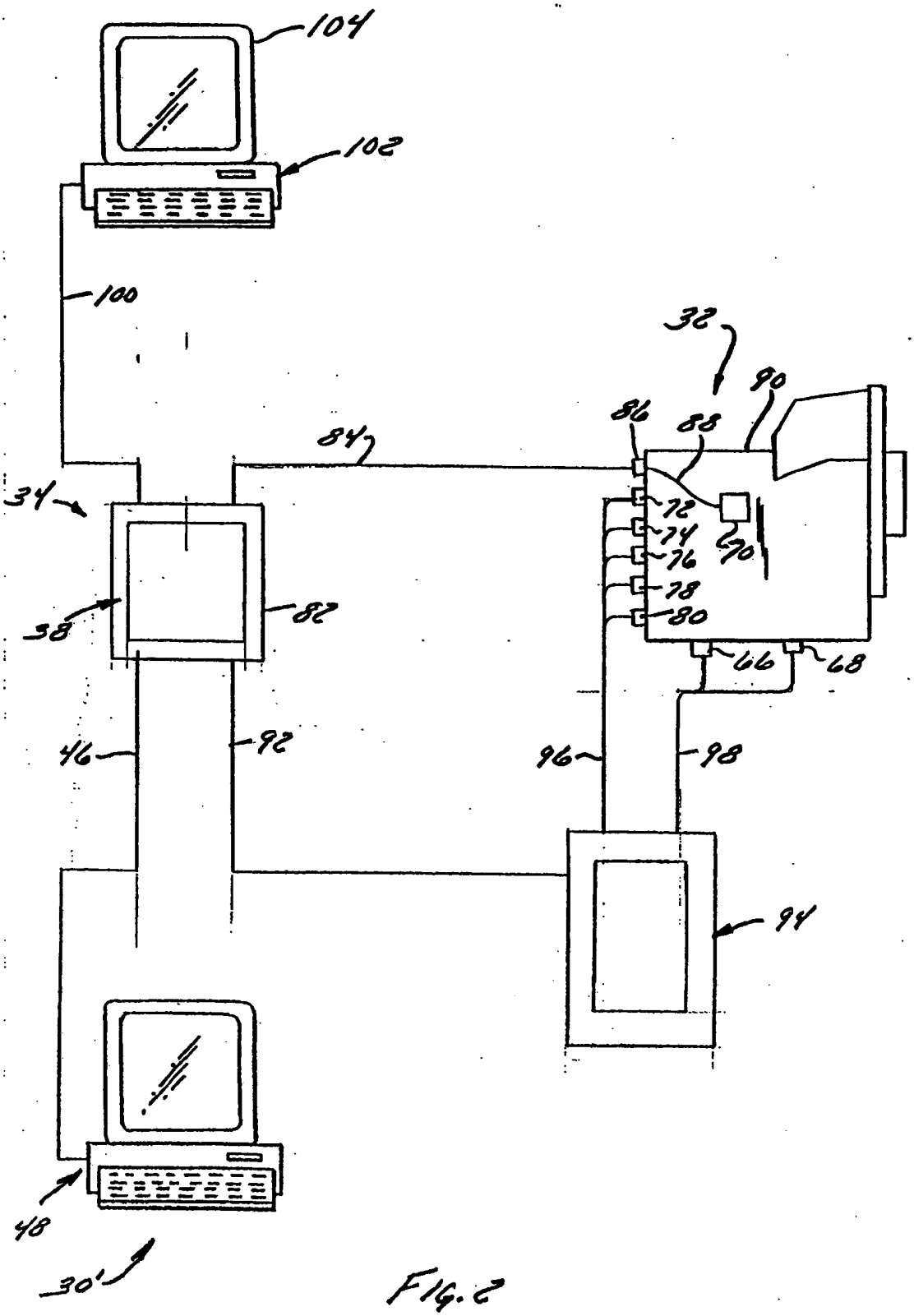
104
102
100
32
90
86
88
84
34
72
74
76
78
80
70
38
82
66
68
46
92
96
98
94
48
30'

Fig. 2

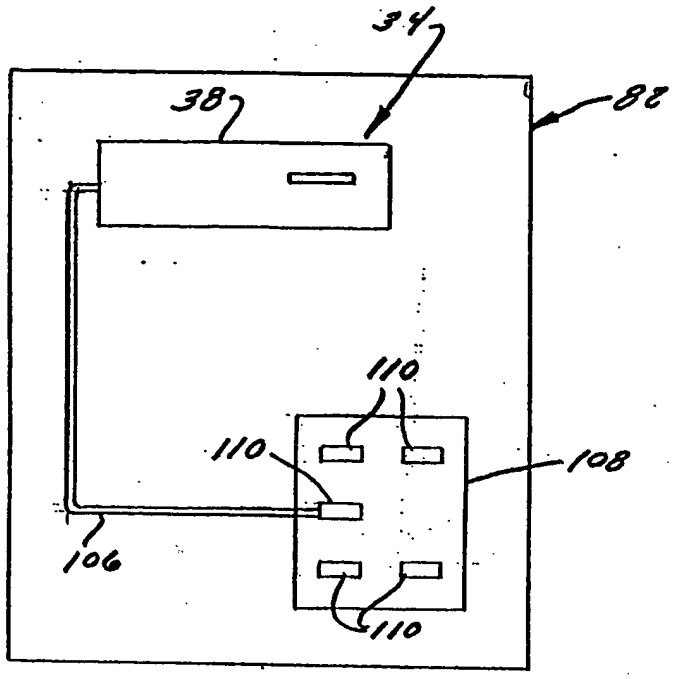

FIG. 3

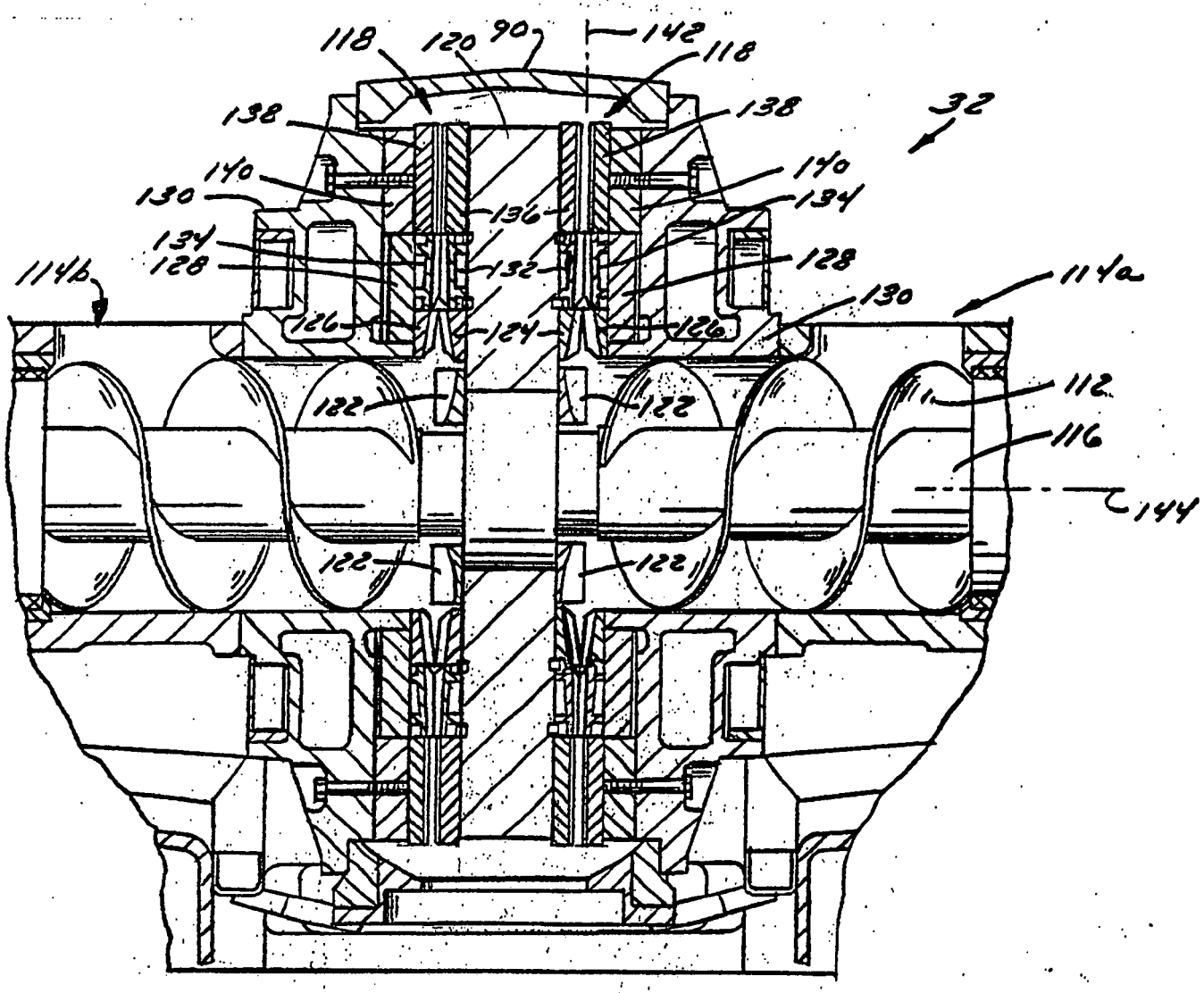
118
120
90
142
118
138
138
32
140
140
130
136
134
134
128
132
128
114b
114a
126
124
126
130
122
122
112
116
144
122
122

FIG. 4

T00260 2623860

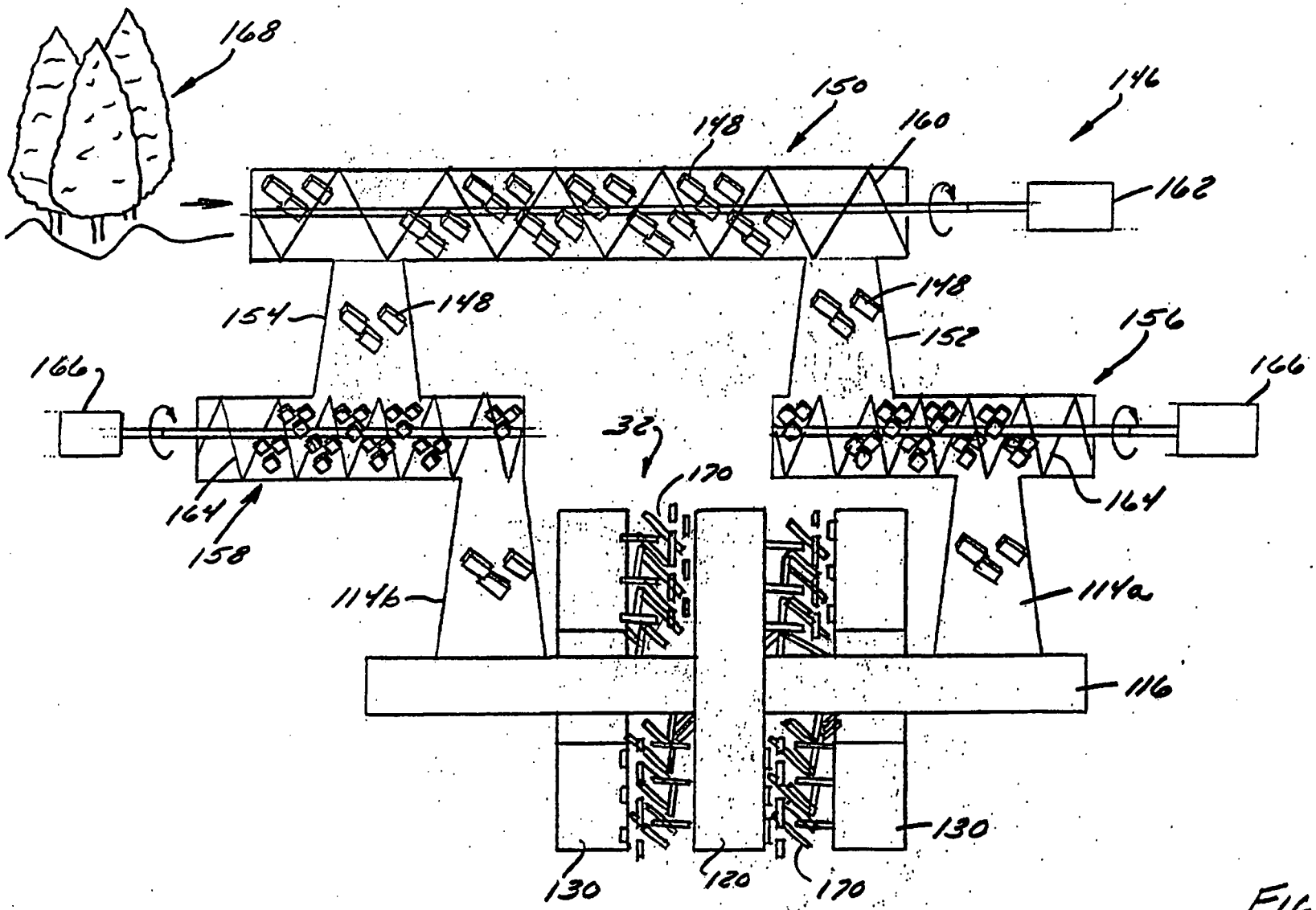

FIG. 5

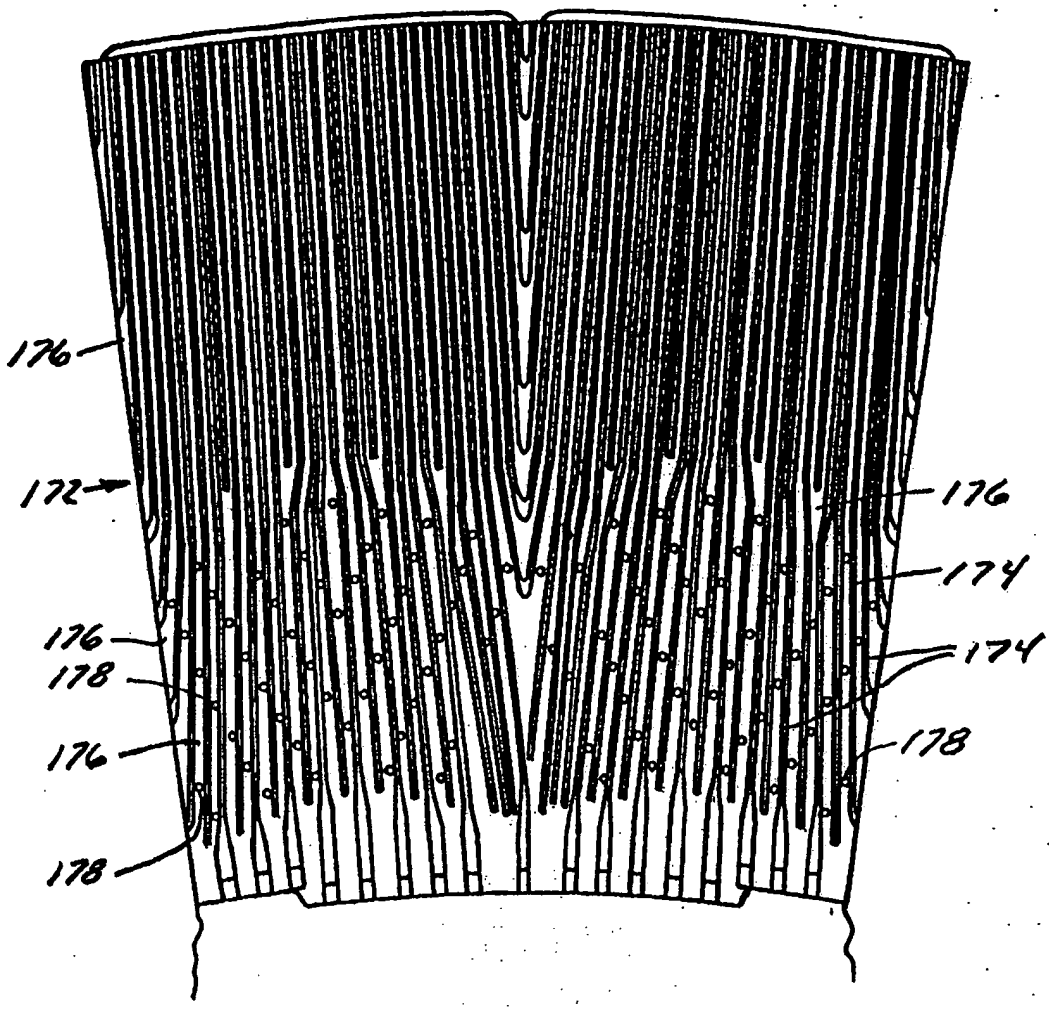

FIG. 6

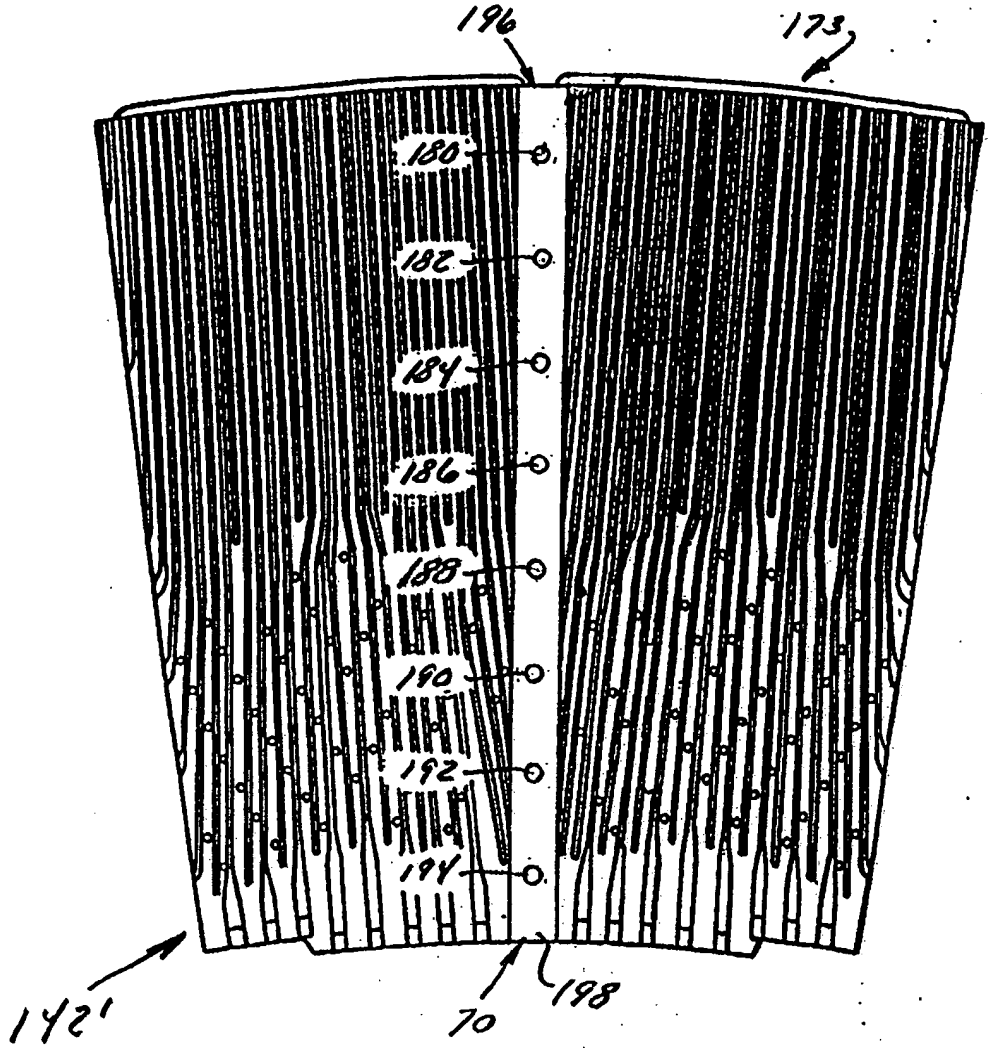

FIG. 7

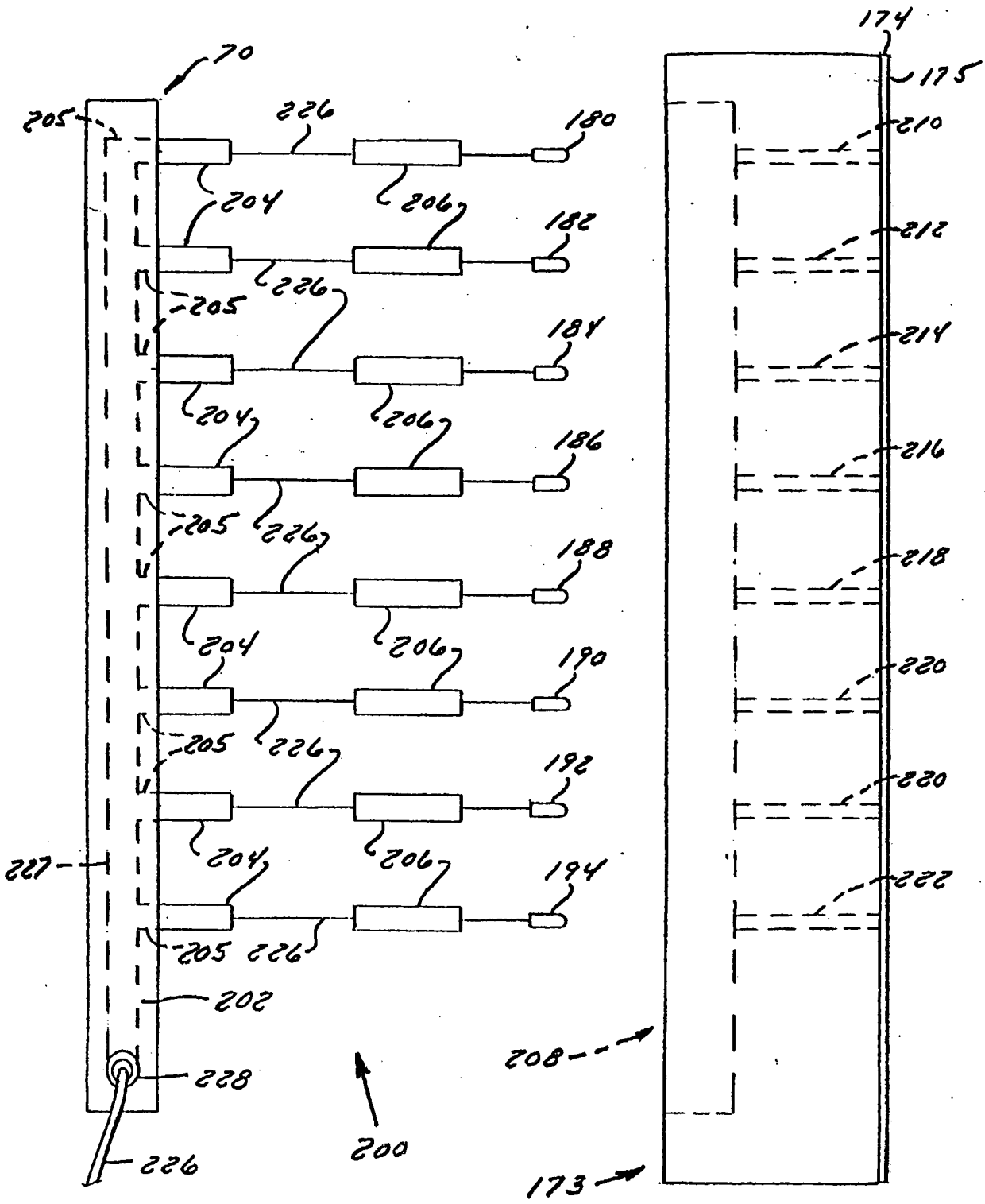
70
205
226
180
204
206
182
205
226
184
204
206
186
205
226
188
204
206
190
205
226
192
204
206
194
205
226
227
202
228
226
200
208
173
174
175
210
212
214
216
218
220
220
222

FIG. 8

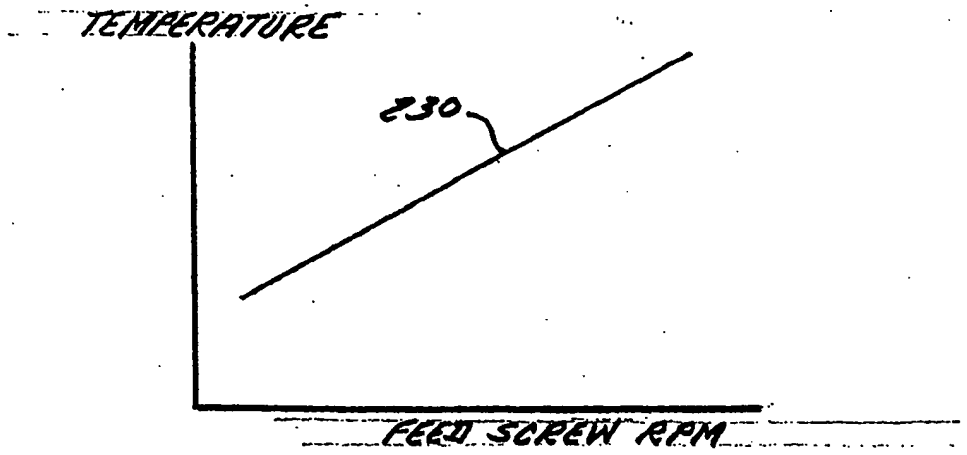

FIG. 9

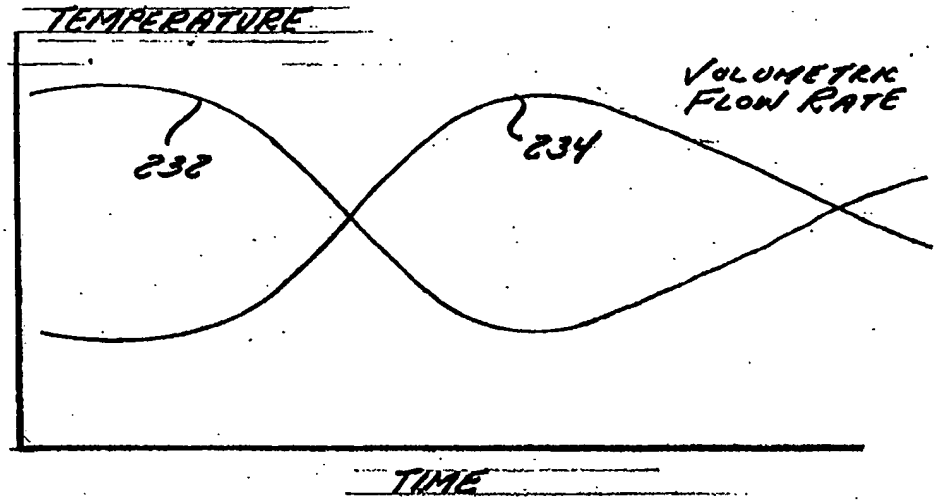

FIG. 10

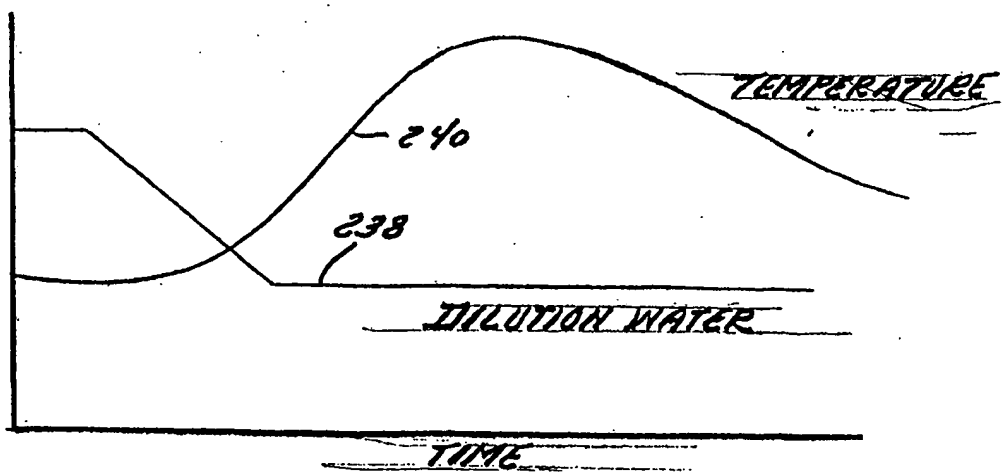

FIG. 11

PODS20-2E2h7-8b0

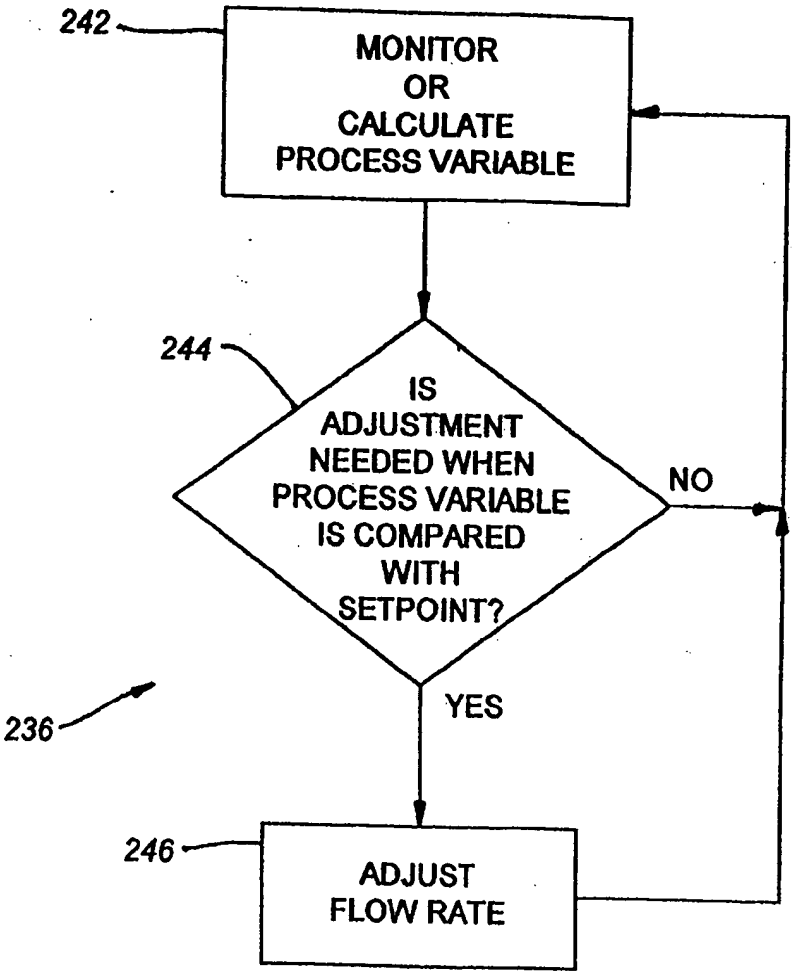
242
MONITOR OR CALCULATE PROCESS VARIABLE
244
IS ADJUSTMENT NEEDED WHEN PROCESS VARIABLE IS COMPARED WITH SETPOINT?
NO
YES
236
246
ADJUST FLOW RATE

FIG. 12

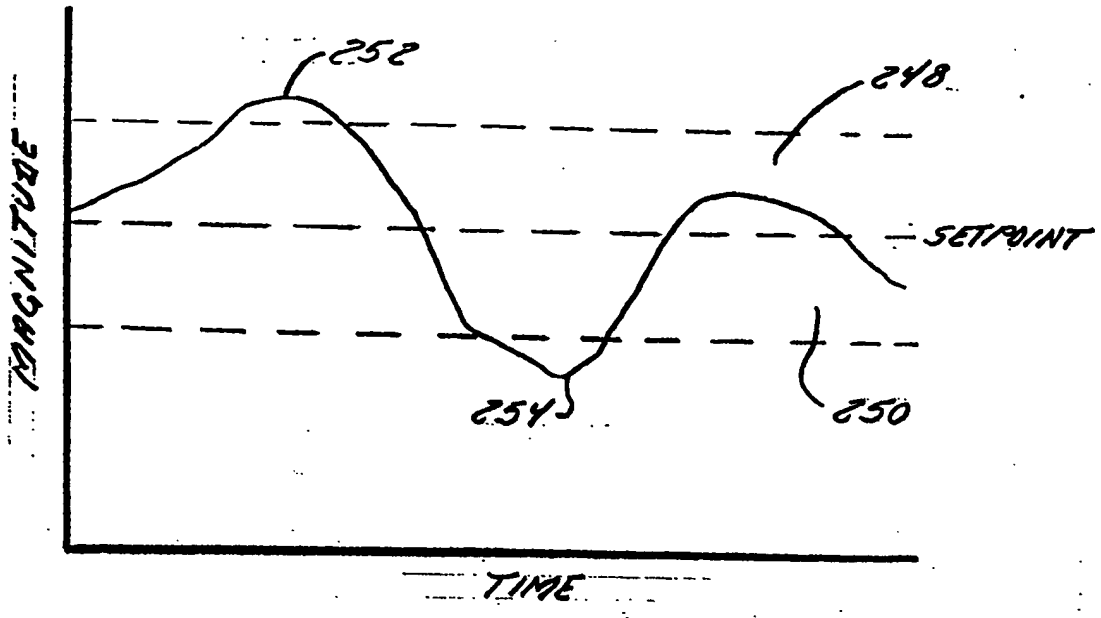
252
248
SETPOINT
MAGNITUDE
254
250
TIME

FIG. 13

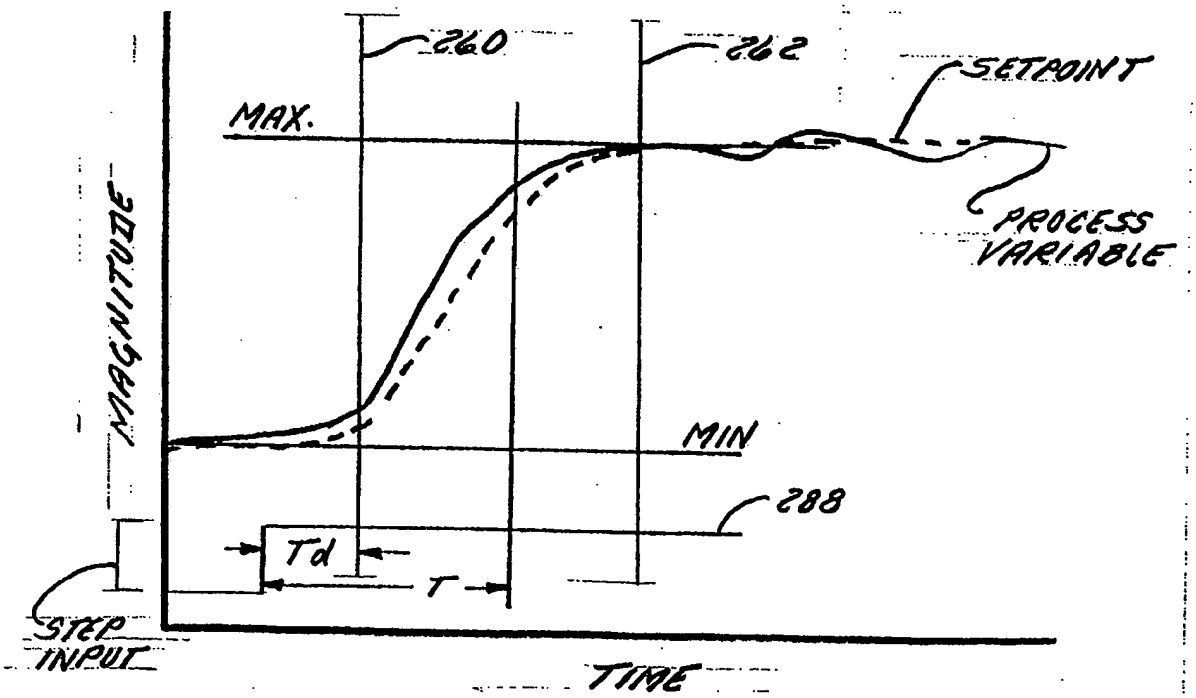
260
262
SETPOINT
MAX.
PROCESS VARIABLE
MAGNITUDE
MIN
288
Td
T
STEP INPUT
TIME

FIG. 15

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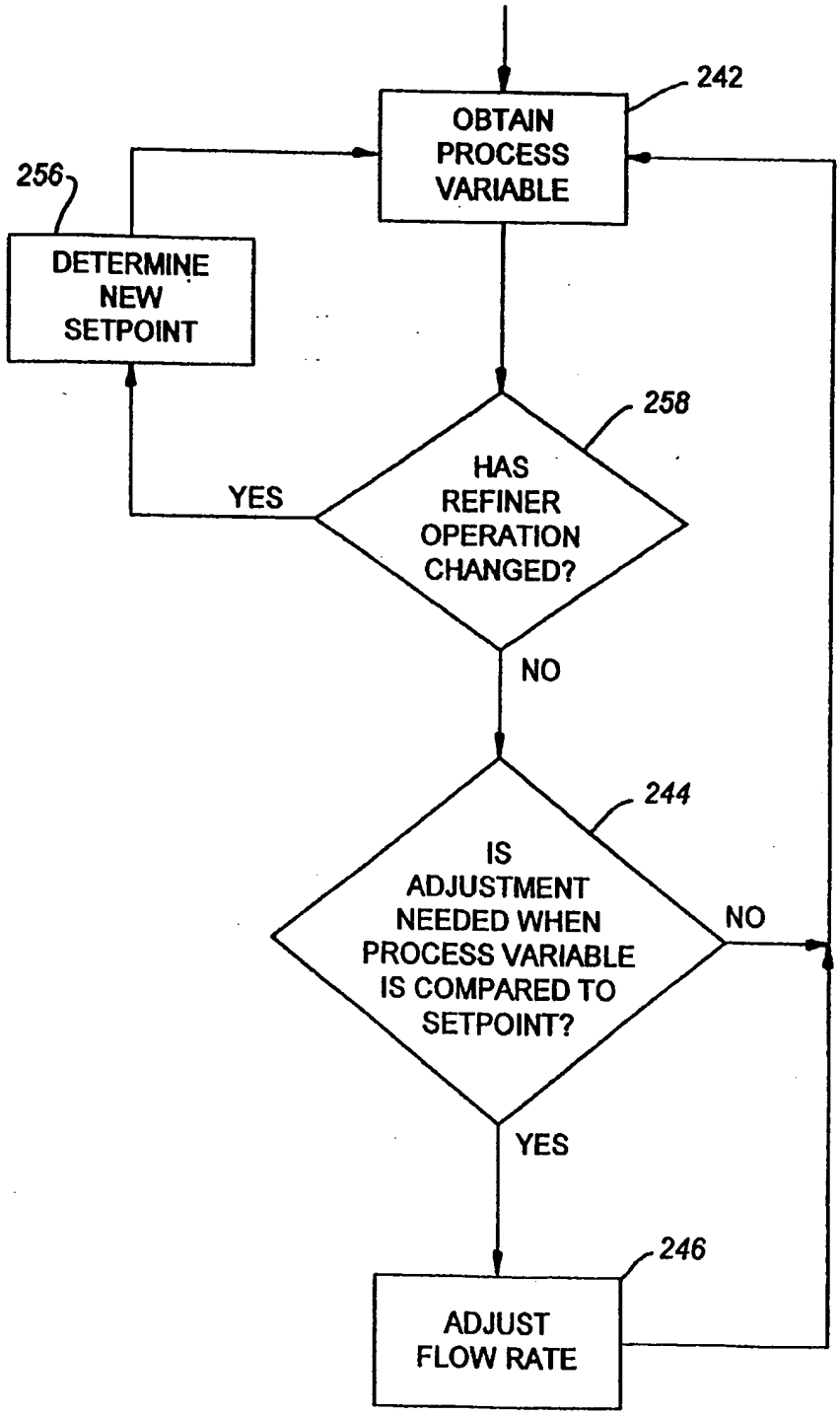


FIG. 14

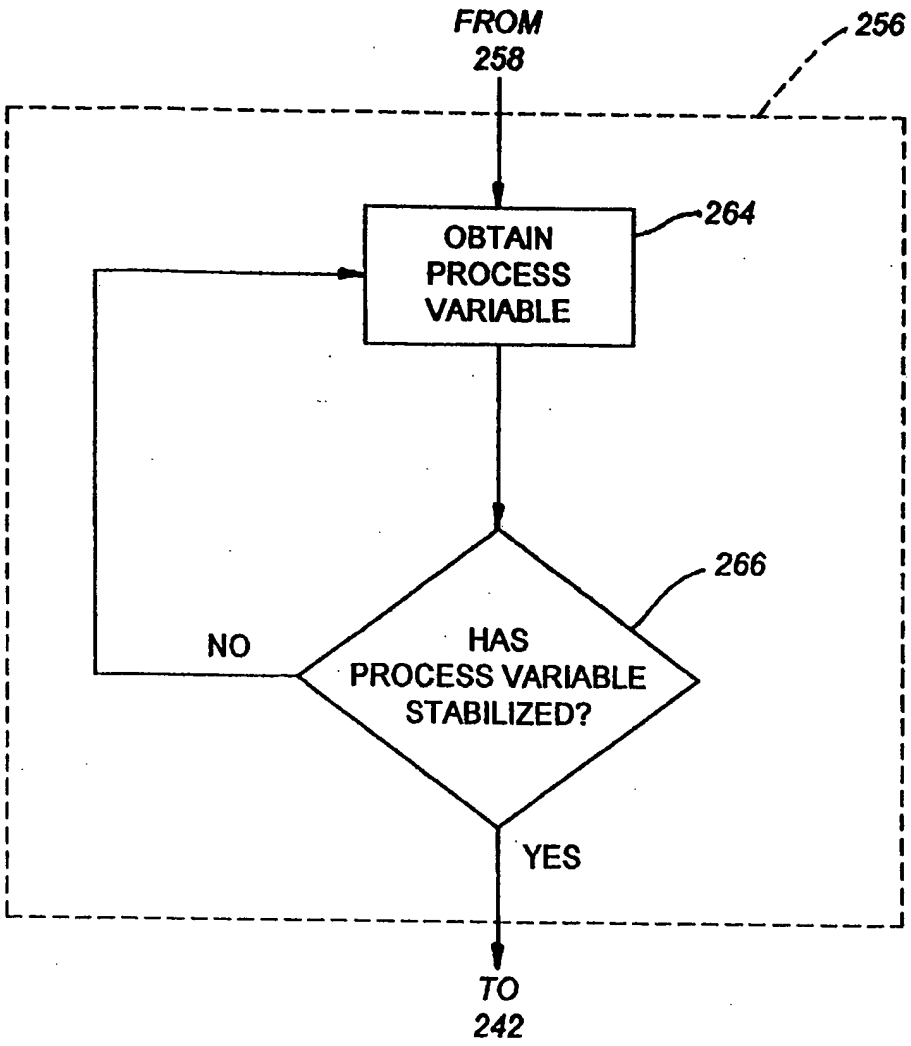

FROM
258
256
OBTAIN
PROCESS
VARIABLE
264
266
NO
HAS
PROCESS VARIABLE
STABILIZED?
YES
TO
242

FIG. 16

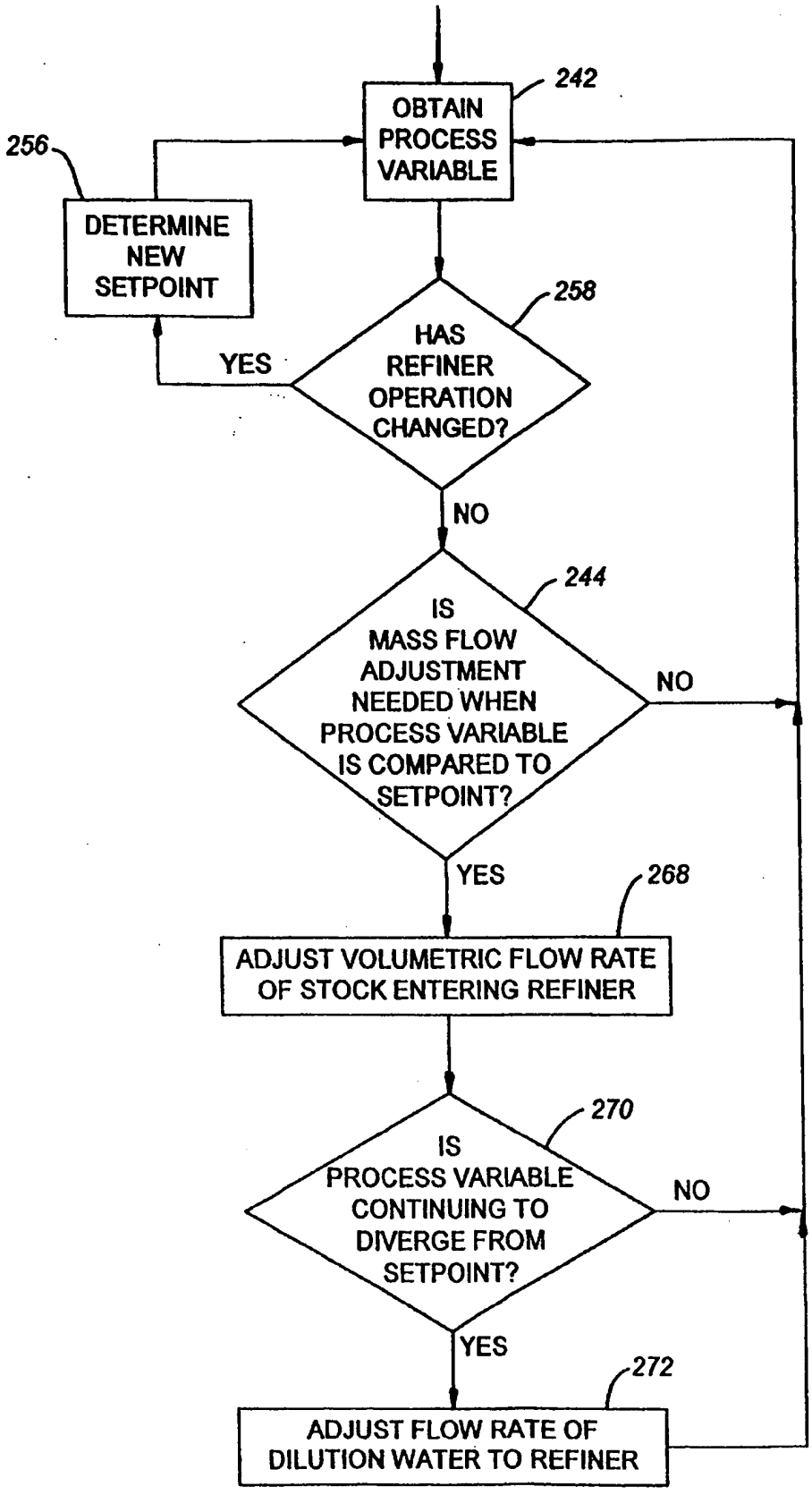

OBTAIN PROCESS VARIABLE
242
DETERMINE NEW SETPOINT
256
HAS REFINER OPERATION CHANGED?
258
YES
NO
IS MASS FLOW ADJUSTMENT NEEDED WHEN PROCESS VARIABLE IS COMPARED TO SETPOINT?
244
NO
YES
ADJUST VOLUMETRIC FLOW RATE OF STOCK ENTERING REFINER
268
IS PROCESS VARIABLE CONTINUING TO DIVERGE FROM SETPOINT?
270
NO
YES
ADJUST FLOW RATE OF DILUTION WATER TO REFINER
272

FIG.17

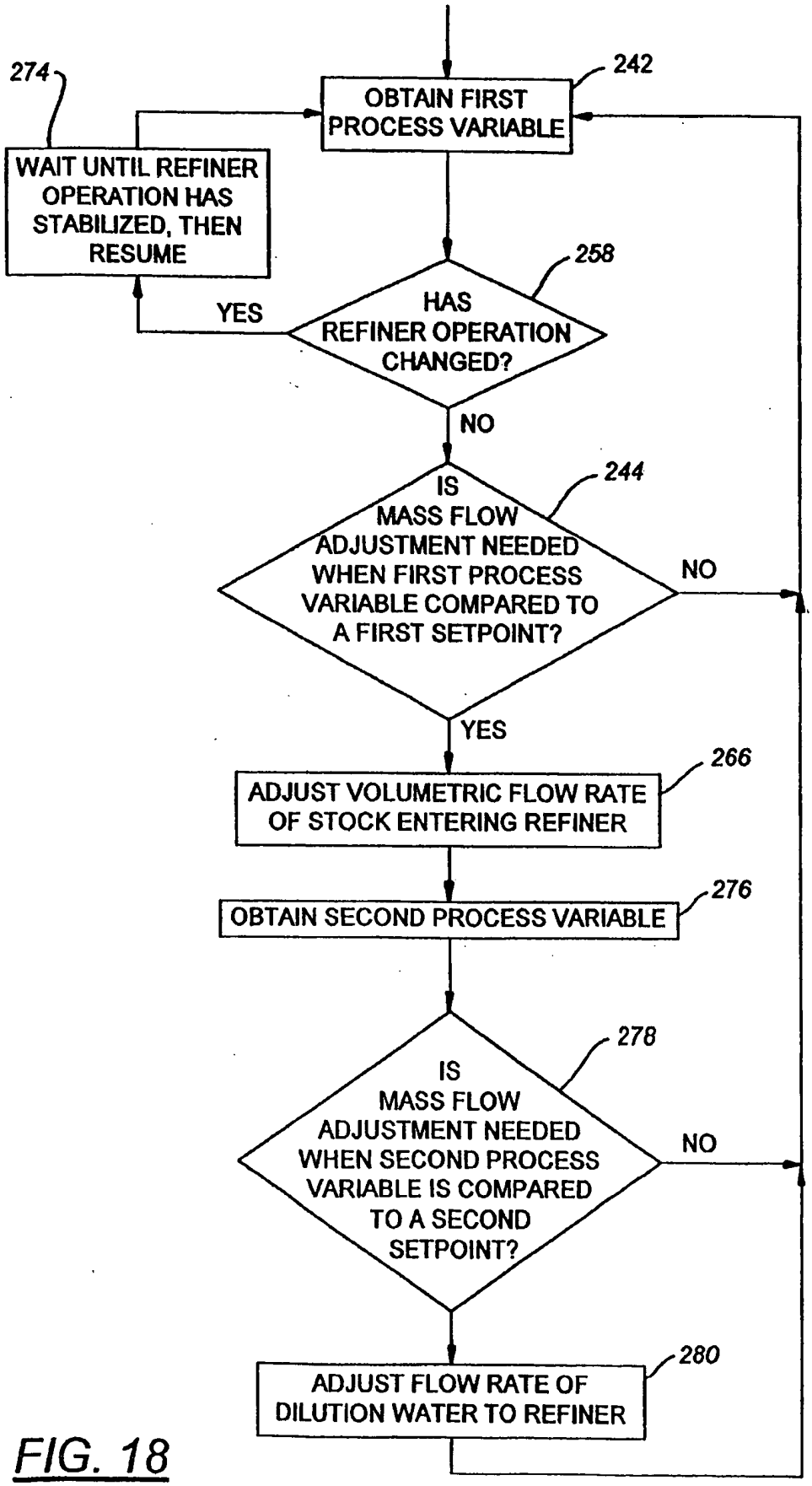

OBTAIN FIRST PROCESS VARIABLE
242
WAIT UNTIL REFINER OPERATION HAS STABILIZED, THEN RESUME
274
HAS REFINER OPERATION CHANGED?
258
YES
NO
IS MASS FLOW ADJUSTMENT NEEDED WHEN FIRST PROCESS VARIABLE COMPARED TO A FIRST SETPOINT?
244
NO
YES
ADJUST VOLUMETRIC FLOW RATE OF STOCK ENTERING REFINER
266
OBTAIN SECOND PROCESS VARIABLE
276
IS MASS FLOW ADJUSTMENT NEEDED WHEN SECOND PROCESS VARIABLE IS COMPARED TO A SECOND SETPOINT?
278
NO
ADJUST FLOW RATE OF DILUTION WATER TO REFINER
280

FIG. 18

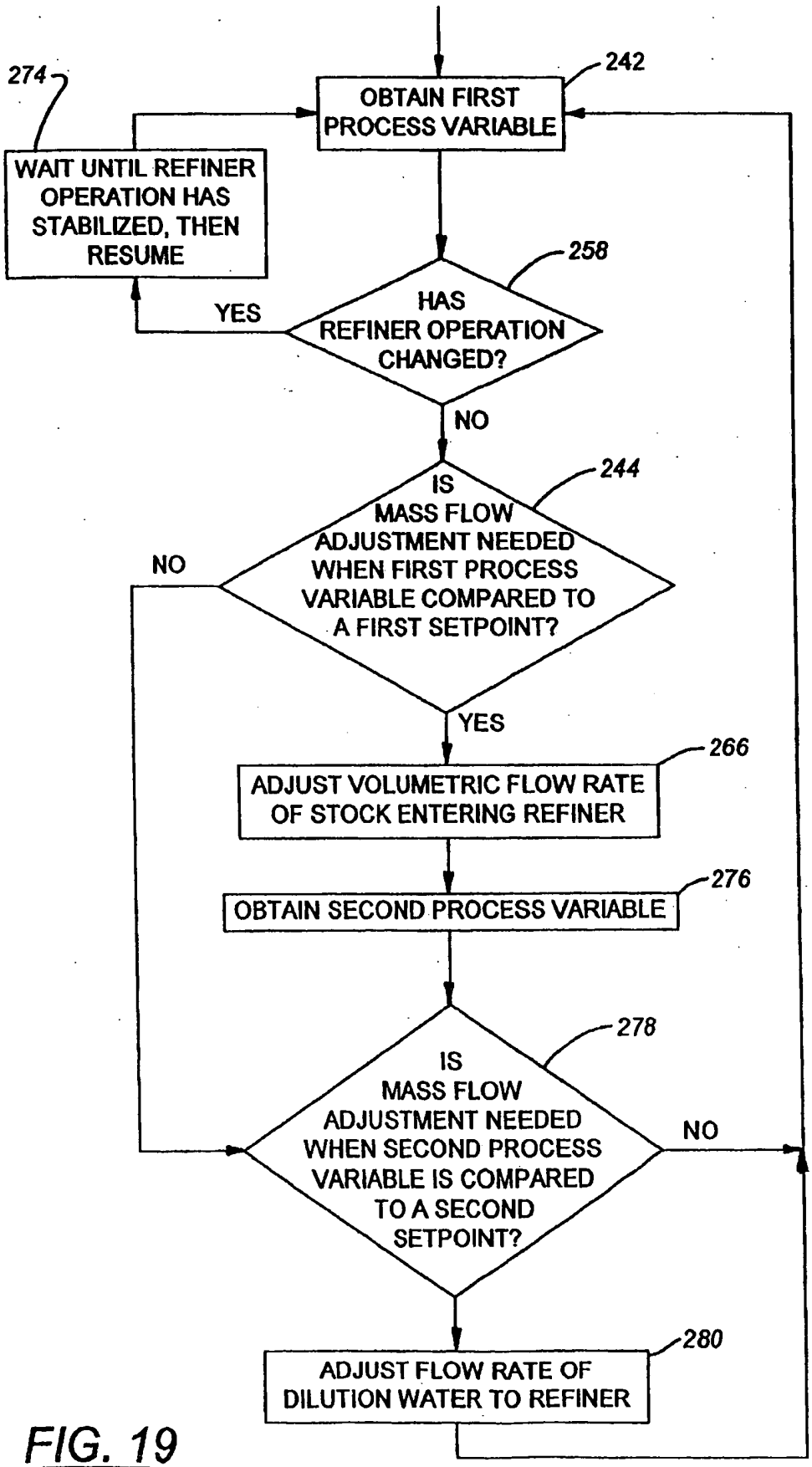

OBTAIN FIRST PROCESS VARIABLE
242
WAIT UNTIL REFINER OPERATION HAS STABILIZED, THEN RESUME
274
HAS REFINER OPERATION CHANGED?
258
YES
NO
IS MASS FLOW ADJUSTMENT NEEDED WHEN FIRST PROCESS VARIABLE COMPARED TO A FIRST SETPOINT?
244
NO
YES
ADJUST VOLUMETRIC FLOW RATE OF STOCK ENTERING REFINER
266
OBTAIN SECOND PROCESS VARIABLE
276
IS MASS FLOW ADJUSTMENT NEEDED WHEN SECOND PROCESS VARIABLE IS COMPARED TO A SECOND SETPOINT?
278
NO
ADJUST FLOW RATE OF DILUTION WATER TO REFINER
280

FIG. 19

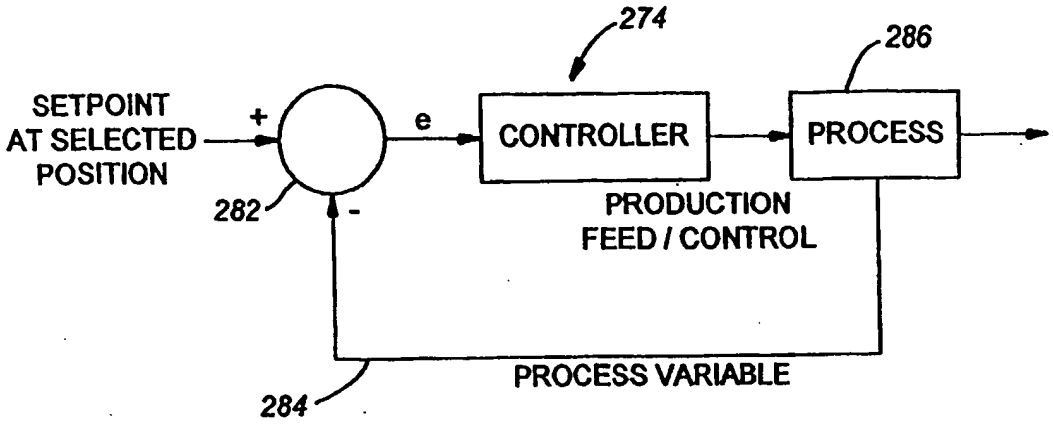

274
286
SETPOINT
AT SELECTED
POSITION
+
e
CONTROLLER
PROCESS
282
-
PRODUCTION
FEED / CONTROL
PROCESS VARIABLE
284

FIG. 20

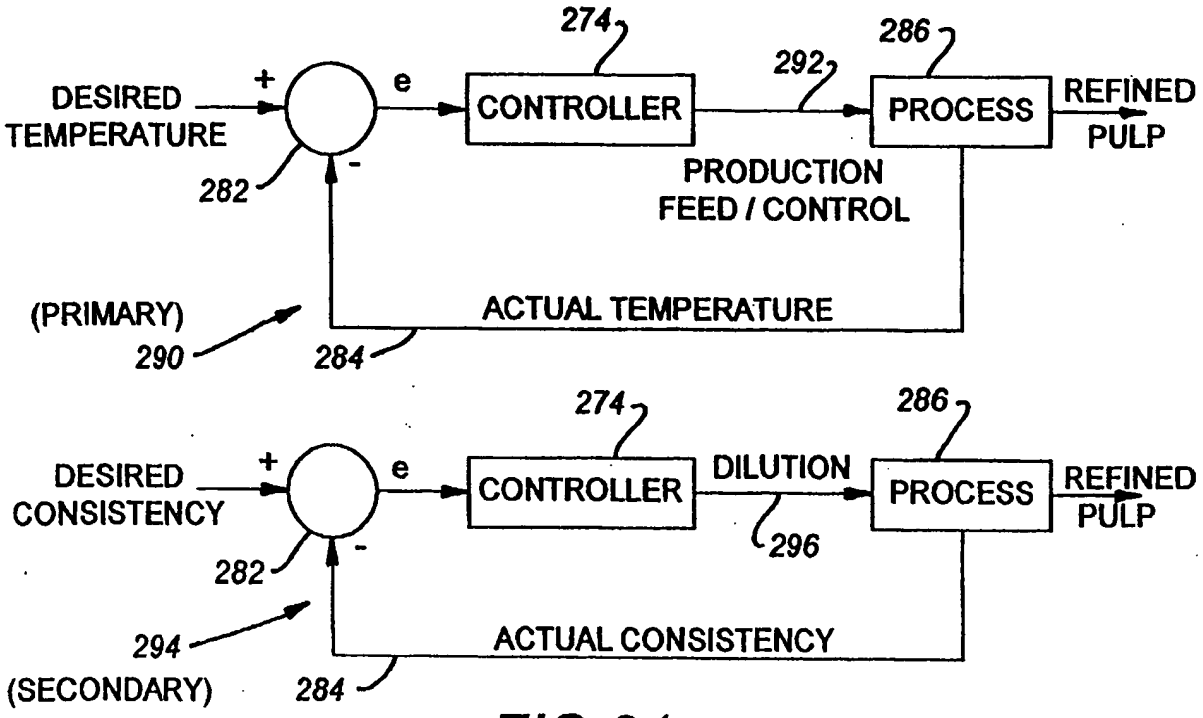

274
286
292
DESIRED TEMPERATURE
+
e
CONTROLLER
PROCESS
REFINED PULP
-
282
PRODUCTION FEED / CONTROL
(PRIMARY)
290
ACTUAL TEMPERATURE
284
274
286
DESIRED CONSISTENCY
+
e
CONTROLLER
DILUTION
PROCESS
REFINED PULP
296
-
282
294
ACTUAL CONSISTENCY
(SECONDARY)
284

FIG.21

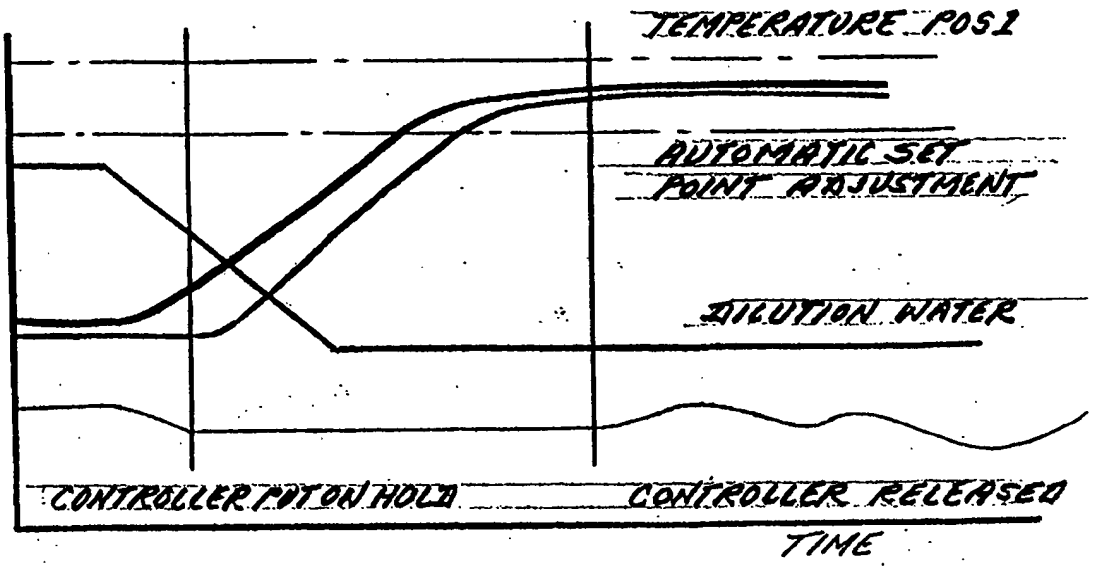

TEMPERATURE POS 1
AUTOMATIC SET POINT ADJUSTMENT
DILUTION WATER
CONTROLLER POT ON HOLD
CONTROLLER RELEASED
TIME

FIG. 22

FOREIGN PATENT

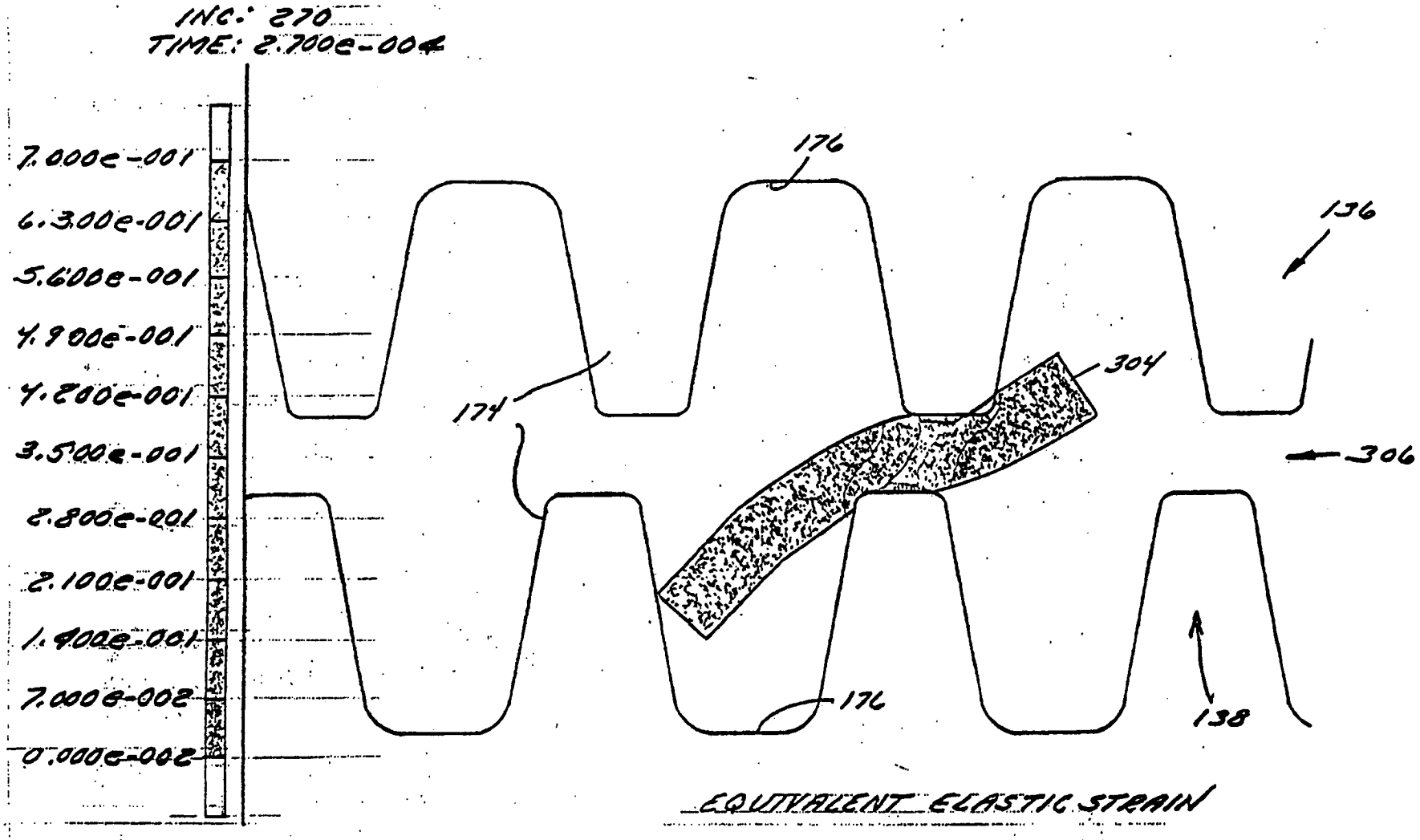


FIG. 23

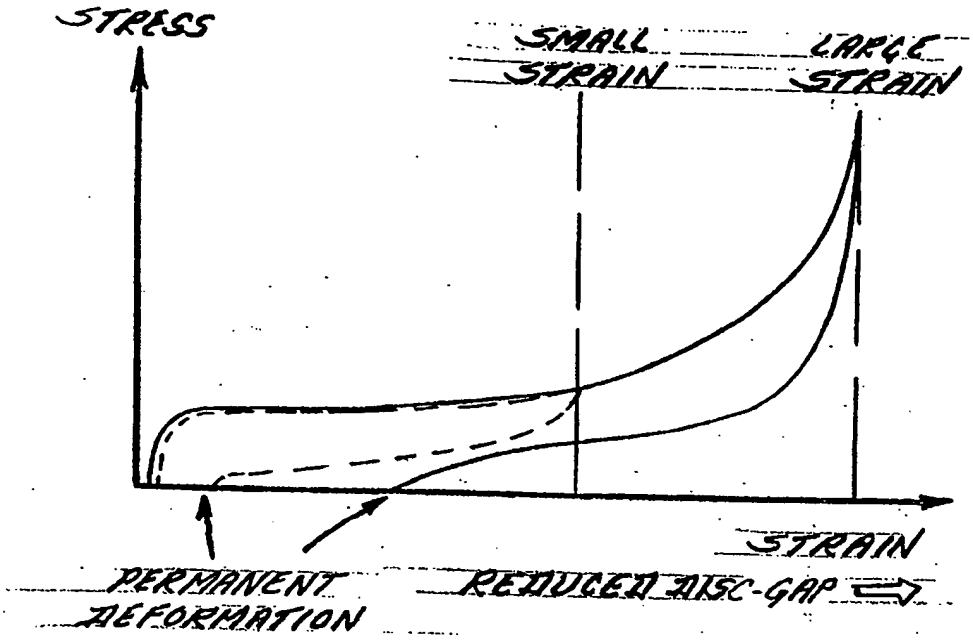
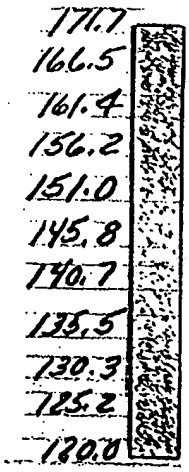

STRESS
SMALL STRAIN
LARGE STRAIN
STRAIN
PERMANENT DEFORMATION
REDUCED DISC-GAP

FIG. 24


171.7
166.5
161.4
156.2
151.0
145.8
140.7
135.5
130.3
125.2
120.0

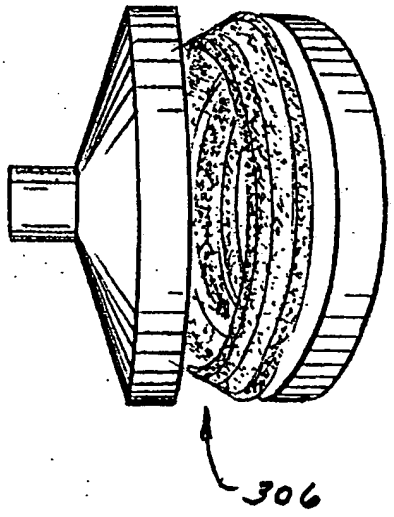

306

FIG. 25

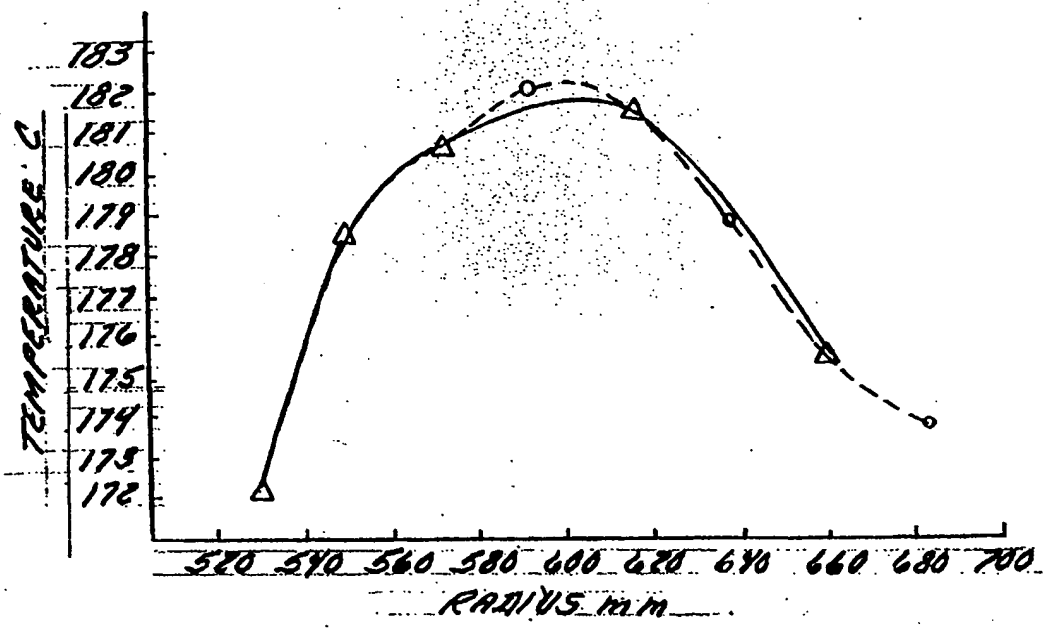

183
182
181
180
179
178
177
176
175
174
173
172
TEMPERATURE C
520 540 560 580 600 620 640 660 680 700
RADIUS mm

FIG. 26

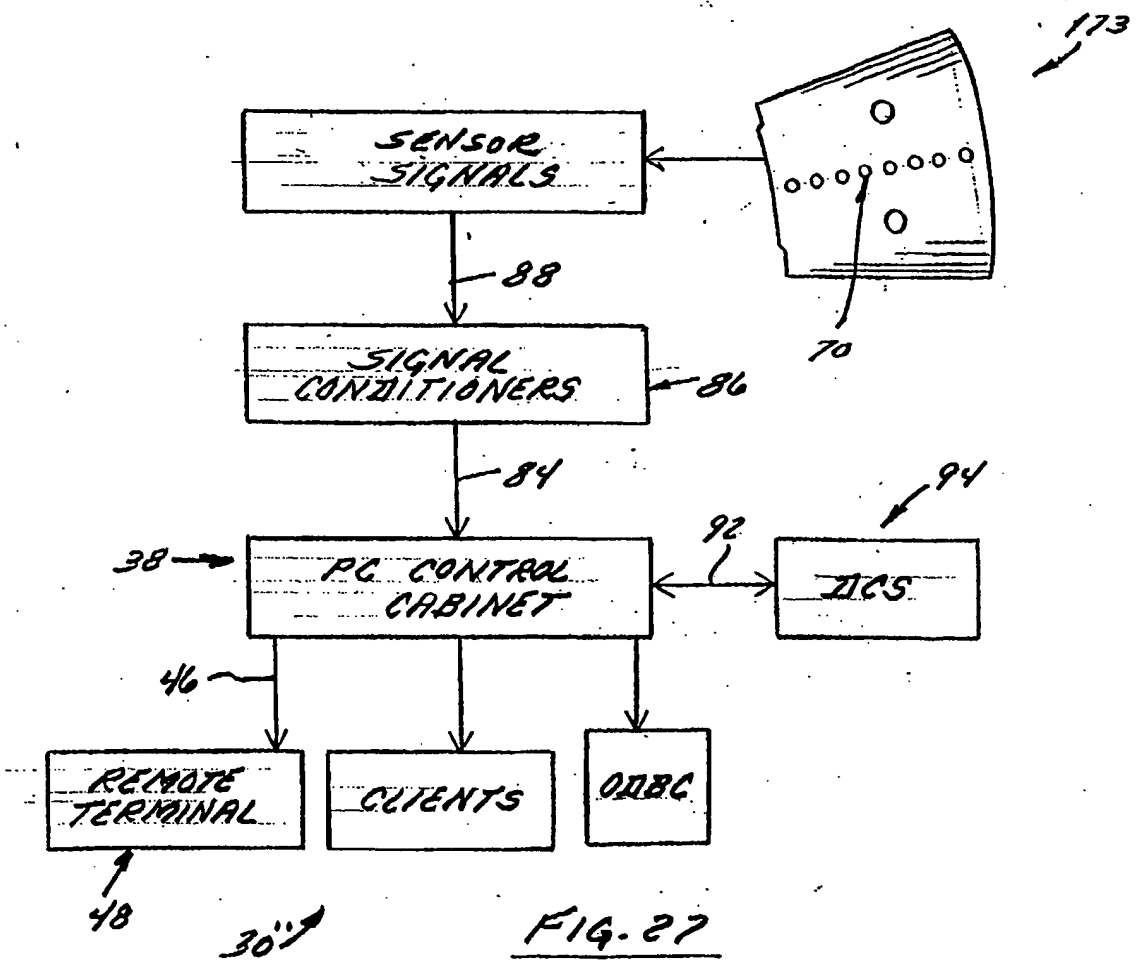

173
SENSOR SIGNALS
88
SIGNAL CONDITIONERS
86
70
84
94
92
38
PC CONTROL CABINET
DCS
46
REMOTE TERMINAL
CLIENTS
ODBC
48
30

FIG. 27

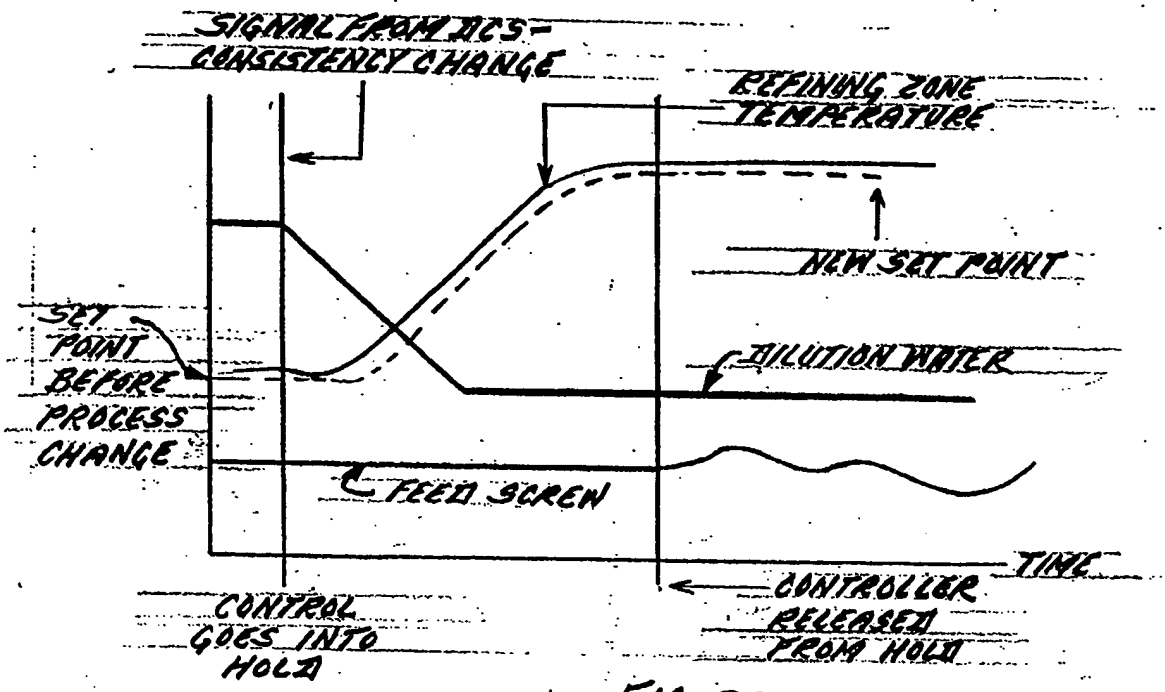

SIGNAL FROM ACS - CONSISTENCY CHANGE
REFINING ZONE TEMPERATURE
NEW SET POINT
SET POINT BEFORE PROCESS CHANGE
DILUTION WATER
FEED SCREW
TIME
CONTROL GOES INTO HOLD
CONTROLLER RELEASED FROM HOLD

FIG. 28

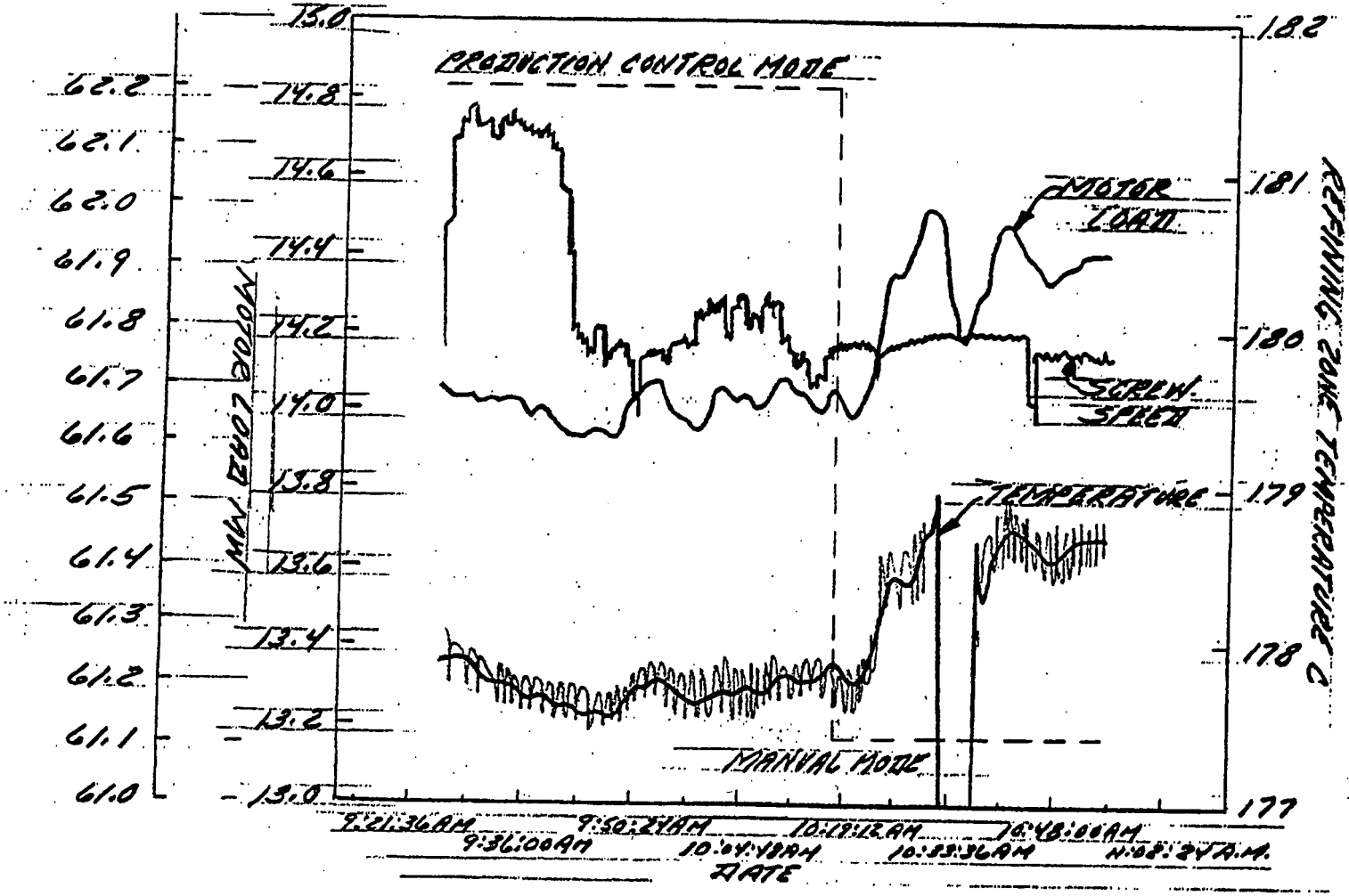

PRODUCTION CONTROL MODE
MOTOR LOAD
SCREW SPEED
TEMPERATURE
MANUAL MODE
MOTOR LOAD MW
REFINING ZONE TEMPERATURE C
62.2
62.1
62.0
61.9
61.8
61.7
61.6
61.5
61.4
61.3
61.2
61.1
61.0
15.0
14.8
14.6
14.4
14.2
14.0
13.8
13.6
13.4
13.2
13.0
182
181
180
179
178
177
9:21:36AM
9:36:00AM
9:50:24AM
10:04:48AM
10:19:12AM
10:33:36AM
10:48:00AM
11:02:24A.M.
DATE

FIG. 29

FOREIGN PATENT

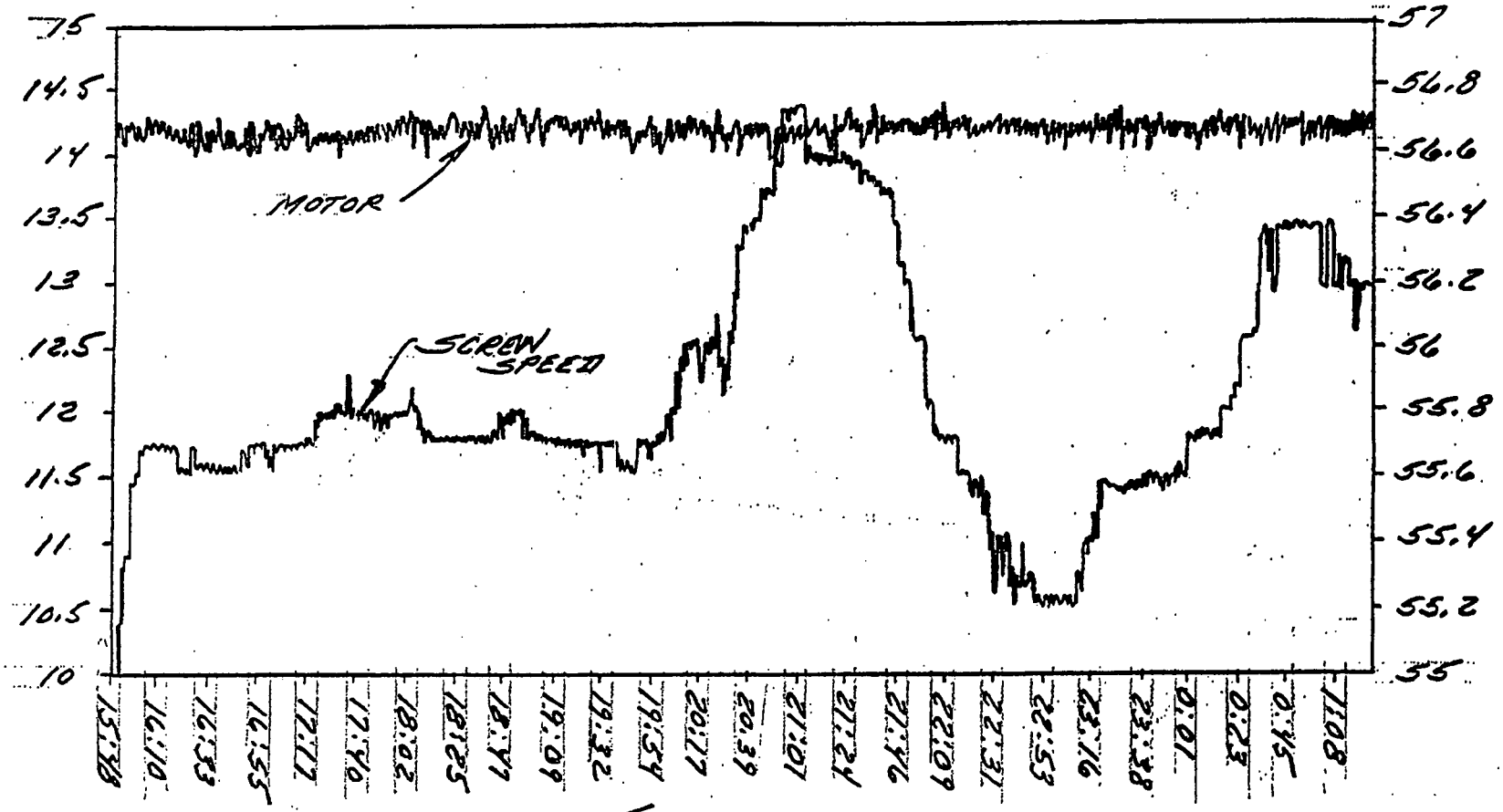


FIG. 30